Vaughan R E & Brann
J. W.

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# HOT FORMALDEHYDE for Potato Seed Treatment

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THE UNIVERSITY OF WISCONSIN, MADISON

THE black scurf fungus, Rhizoctonia, attacks the stems and underground parts, causing these cankers. It frequently kills all the young shoots, causing missing hills. June is the month of most serious injury. This is one of the diseases controlled by hot formaldehyde treatment.

In the field below, seed for the center row was not treated. It shows many missing hills and dwarf plants as compared with the other rows from treated seed.

# Hot Formaldehyde for Potato Seed Treatment

R. E. Vaughan and J. W. Brann

HOT FORMALDEHYDE, properly applied, will help greatly in checking several of the various diseases of potatoes.

The solution (mixed in the proportion of one pound or pint in fifteen gallons of water, heated to 125°F) will kill in two and one half minutes the surface borne germs of potato scab, black scurf or Rhizoctonia, and black leg.

### Adapted to Cooperative Treatments

The use of hot formaldehyde seed treatment is especially adapted to cooperative and community seed treating, and to that by growers who plant large amounts of seed. It may also serve as a rapid, efficient, and safe method for growers who wish to treat potatoes in carload lots before shipment to prospective buyers.

Seed treatment, with corrosive sublimate, has been practiced by many Wisconsin growers during past years and still has an important place in the potato improvement program, especially with small growers who do not have the proper facilities for maintaining the degree of temperature so essential to good results in the use of hot formaldehyde.

### Advantages of Hot Formaldehyde

The disadvantages in the use of corrosive sublimate are: its poisonous nature when taken internally; its rapid loss of strength with use; its cost in time and chemical; and its corroding action on metals.

In spite of these disadvantages, corrosive sublimate still has an important place where its use is understood and where it has been successfully employed. Hot formaldehyde, on the other hand, has a pungent odor which prevents it being taken internally; it costs less than half as much as corrosive sublimate; it permits rapid treatment, two and one-half minutes as compared with one and one-half hours; it does not injure metal tanks; and it loses little strength with use.

A comparison of the efficiency of corrosive sublimate and hot formaldehyde in controlling the diseases mentioned has shown that little difference need be expected. One method is practically as efficient as the other.

### Results of Hot Formaldehyde Treatment

The hot formaldehyde treatment is not new. It is being used successfully in Minnesota, North and South Dakota, Iowa, Kansas, Nebraska, Colorado, California, and other potato producing states. It

was devised in 1918 by Dr. I. E. Melhus, of the Iowa Experiment Station. Wisconsin demonstrations in 1925 in Oconto, Oneida, and Washburn counties were all successful.

One of the Washburn county demonstrations showed 61 per cent scab when no treatment was given, and 1 per cent where hot formaldehyde was used.

At the Branch Experiment Station farm at Spooner, no treatment showed 5 per cent scab, corrosive sublimate 4 per cent, and hot formaldehyde 3 per cent.

At Crookston, Minnesota, the untreated seed gave 24 per cent scab, corrosive sublimate 6 per cent and hot formaldehyde 5 per cent. Black scurf was reduced in about the same proportion.

A three-year yield test at Kansas, in the famous Kaw Valley, shows that hot formaldehyde gave an increase of 41.6 bushels per acre over the untreated seed.

In California, the largest individual potato growers in the United States have discontinued the use of corrosive sublimate. In 1924 their expense item for corrosive sublimate alone was $7,000. They treated 50,000 bushels seed with hot formaldehyde in 1925.

### Must Have Proper Temperature

Since proper temperature is essential to good results, an accurate thermometer is of the utmost importance in using the hot formaldehyde method of treating potatoes. A standard dairy thermometer costs from $.75 to $1.50 and is usually correct. To make sure, have it checked by a druggist or creameryman or send it to the Plant Pathology Department, College of Agriculture, Madison. Your county agent will gladly attend to this detail, if requested.

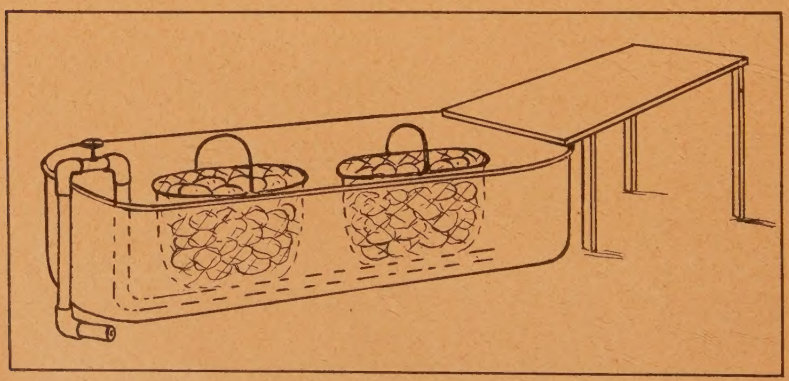

FIG. 1.—DIRECT STEAM METHOD

By this method it is easy to control the temperature. The method is rapid but dilutes the solution.

### How to Treat Potato Seed

The proper temperature of 125°F. is more easily maintained when the amount of treating solution is large in proportion to that of potatoes. The solution may be heated by direct steam, steam coil, or machine. The treating machines are the most satisfactory.

**Direct Steam Method.**—Steam may be secured from a traction engine, creamery, cheese factory or other steam heating plant. (Fig. 1.)

1. Select a stock tank of about 125 gallons capacity. Set it near the boiler, connect boiler and tank with iron steam pipe with shut off valve near the tank. Insulate pipe to prevent too great condensation of steam. Insulate tank to prevent too rapid cooling of solution. Felt building paper is satisfactory.

2. Fill the tank two-thirds full of water.

3. Add formaldehyde, one pound (pint) to each 15 gallons water. (231 cubic inches equals 1 gallon). Mark the level on side of tank.

4. Heat solution to 125°F. Use tested thermometer. **Be careful.**

5. Handle potatoes in wire baskets, crates or sacks. Two to four bushels is enough to handle at one treatment.

6. Dip the potatoes **two and one-half minutes,** drain solution back into tank on tight sloping shelf along side or end of tank, pile, and cover one hour. Use canvas, blankets, or sacks. This holds the formaldehyde fumes around the potatoes.

7. Remove cover and dry. Tubers may be cut and planted at once.

8. Allow for condensation water from the steam by adding nine-tenths pound of formaldehyde after every 50 bushels treated. Keep solution to original volume by replacement from a reserve solution of standard strength, one pound to 15 gallons water.

9. If the tubers are to be held for any great length of time after treatment before planting they should be again covered, after drying off to protect them from seed corn maggot flies. These insects are known to spread black leg germs when laying their eggs.

**Steam Coil Method.**—The details of this method of treatment are the same as in the direct steam method, with the exception that the steam is confined in coils at the bottom or sides of the tank. There should be a protection of some kind over the coils to prevent direct contact and injury to the potatoes. In this method there is no appreciable weakening of the solution since there is no condensation of steam added to the solution. It is unnecessary, therefore, to add formaldehyde. In this respect the steam coil method resembles the machine treatment.

**Machine Method.**—There are several satisfactory treating machines on the market. The solution is made up at the standard strength, one pound to 15 gallons water, in amounts called for by the machine capacity. The solution is heated by blow torches supplied with gasoline or kerosene under low pressure. They have the advantage over steam in

that no water of condensation is added. The strength of the solution remains practically constant, hence the cost of treatment is lower than with steam. The other details of treatment are the same as in the direct steam method. Always treat seed before it is cut. (Fig. 3.)

### Seed Selection and Crop Rotation

Seed treatment, while of great value in controlling potato scab and Rhizoctonia, cannot be relied upon for complete control of these diseases. The reason is that the germs causing them can remain alive in the soil for several years. Since different crops are not affected by the same diseases, a rotation of crops is important in keeping the germs down to a point where they are of little practical importance. Seed which is free from disease, to begin with, is of greater strength and vigor than diseased seed, hence it is important to select good healthy seed. Furthermore, there is no treating expense connected with selection, and it is something that every potato grower is usually glad to do.

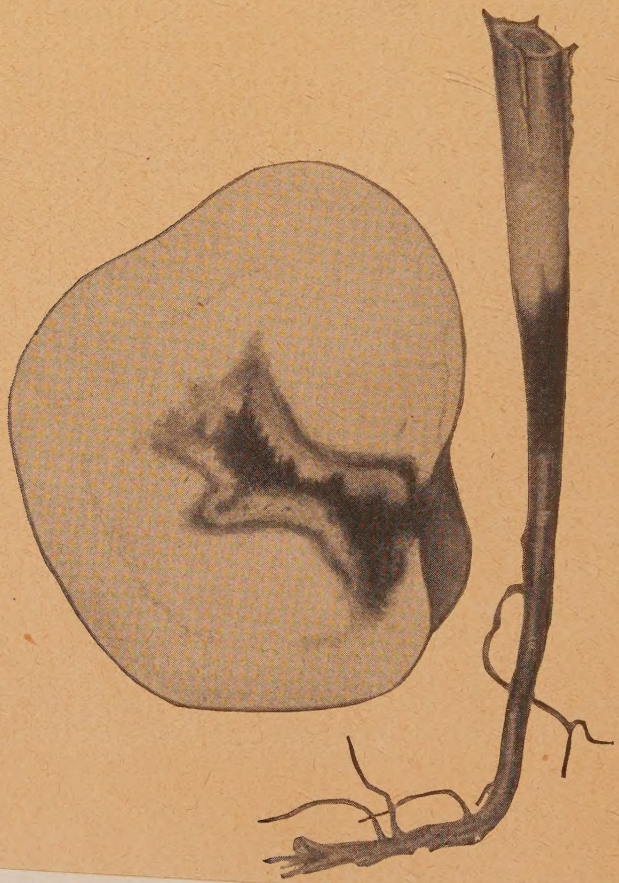

FIG. 2.—BLACK LEG ON STEM AND TUBER

This disease may be carried from year to year on the seed tubers. Hot formaldehyde treatment is one of the best remedies.

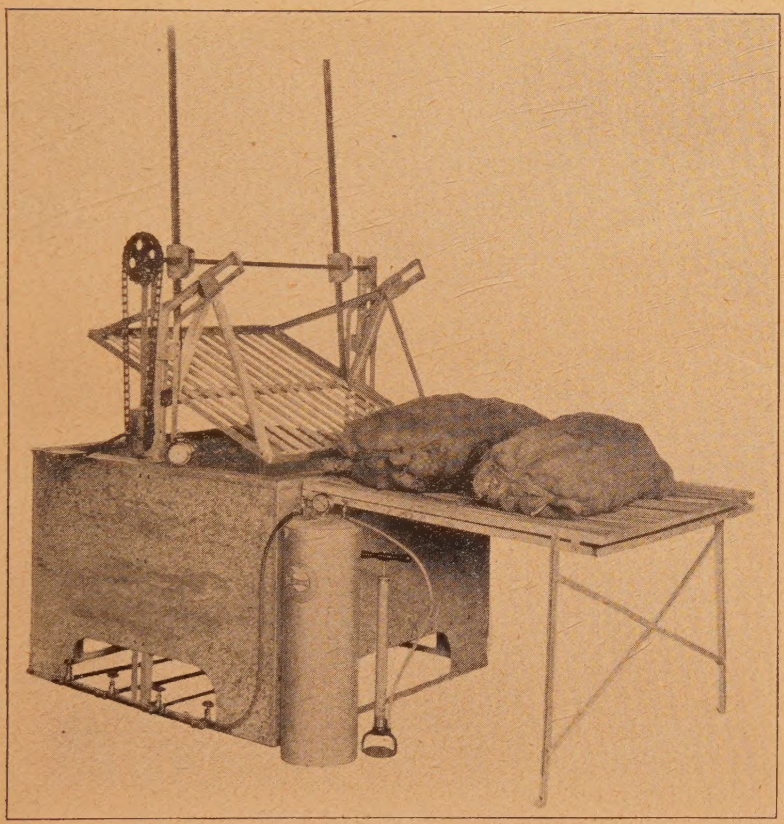

FIG. 3.—IMPROVED HOT FORMALDEHYDE SEED TREATING MACHINE

Solution is heated by gasoline or kerosene blow torches. The method is rapid and convenient, and the solution maintains its strength. (Addresses of manufacturing companies will be sent on request.)

## Hot Formaldehyde Treatment

*Controls*

Potato scab
Potato black scurf
Potato black leg

*Provides*

A sound investment
A good insurance
A profit for growers

*Formula*

One pint formaldehyde
Fifteen gallons water
Temperature 122° to 125° F.
Time, two and one-half minutes
Drain and cover one hour

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